(19) JAPANESE PATENT OFFICE

PATENT ABSTRACTS OF JAPAN

(11) Publication number: **05283093 A**

(43) Date of publication of application: **29.10.93**

(51) Int. Cl **H01M 8/10**
H01M 8/02

(21) Application number: **04080594**

(22) Date of filing: **02.04.92**

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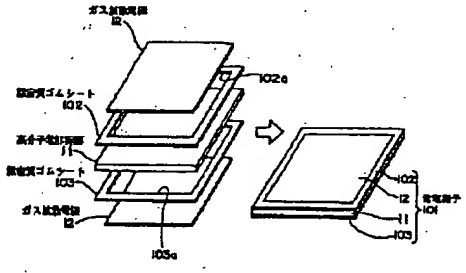
(54) SOLID HIGHPOLYMER ELECTROLYTE FUEL CELL

(57) Abstract:

PURPOSE: To provide the solid highpolymer electrolyte fuel cell, in which the gas sealing property at the periphery of a gas diffusion electrode is secured and which has a high degree of freedom in the selection of the operating condition.

CONSTITUTION: A highpolymer electrolyte film 11, frame-like fine rubber sheets 102, 103 provided in the periphery of the film surface of the highpolymer electrolyte film, gas diffusion electrodes 12, which respectively contacts inside of notch parts 102a, 103a of the frame-like fine rubber sheets 102, 103 at the central part of the film surface are bonded by the thermocompression bonding to form a power generating element 101 to be pinched by separators with groove. The obtained power generating element 101 and the separators with groove are laminated to obtain a power generating stack having the excellent gas sealing property.



JAPANESE [JP,05-283093,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS OPERATION EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

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1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

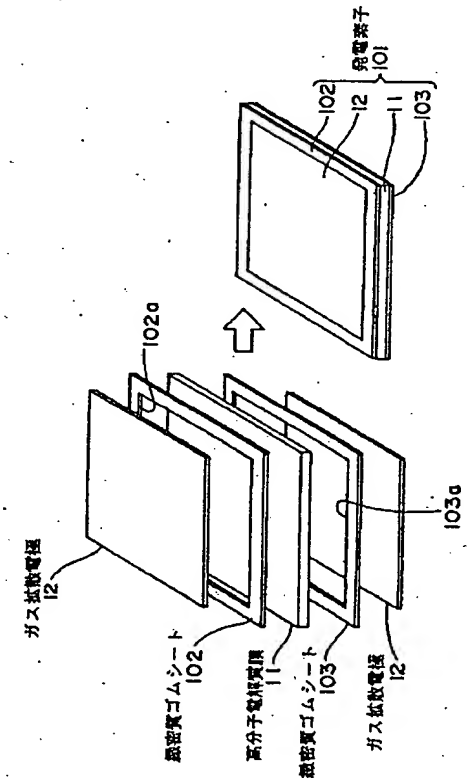
[Claim(s)]

[Claim 1] The solid-state polyelectrolyte fuel cell which comes mutually to carry out the laminating of the fluting separator which supplies fuel gas to the power generation element which consists of a polyelectrolyte film which is characterized by providing the following, and which was ****(ed) between gas diffusion electrodes, and one side of the above-mentioned gas diffusion electrode, and supplies oxidization gas to another side respectively. The above-mentioned power generation element is a polyelectrolyte film. The nature rubber sheet of precise prepared in the periphery section of the film surface of this polyelectrolyte film. The gas diffusion electrode prepared in the center section of the above-mentioned film surface.

[Translation done.]

Drawing selection

[Representative drawing]



[Translation done.]

CLAIMS

[Claim(s)]

[Claim 1] The solid-state polyelectrolyte fuel cell which comes mutually to carry out the laminating of the fluting separator which supplies fuel gas to the power generation element which consists of a polyelectrolyte film which is characterized by providing the following, and which was ****(ed) between gas diffusion electrodes, and one side of the above-mentioned gas diffusion electrode, and supplies oxidization gas to another side respectively. The above-mentioned power generation element is a polyelectrolyte film. The substantia-compacta rubber sheet prepared in the periphery section of the film surface of this polyelectrolyte film. The gas diffusion electrode prepared in the center section of the above-mentioned film surface.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the solid-state polyelectrolyte fuel cell using the ion conductivity of a solid-state polyelectrolyte film.

[0002]

[Description of the Prior Art] An example of the conventional solid-state polyelectrolyte fuel cell is shown in drawing 5 . As shown in this drawing, a solid-state polyelectrolyte fuel cell the porosity carbon electrode (it is hereafter called a "gas diffusion electrode" --) of ****** which made the platinum catalyst prepared in both sides of the solid-state polyelectrolyte film 11 of hydrogen ion conductivity, and this electrolyte film 11 support It is a thing possessing the fluting separator 15 and 16 which is formed as sandwiches 12, the power generation element 14 which consists of 13, and the both sides of this power generation element 14, and supplies fuel gas (for example, H2) to one side of the above-mentioned gas diffusion electrode, and supplies respectively oxidization gas (for example, O2 or air) to another side. Gas is respectively supplied to the above-mentioned fluting separator 15 and 16, power is generated, and current is taken out from the fluting separator 15 and 16.

[0003] Gas passagewaies 15a and 16a are formed in this fluting separator 15 and 16 at both sides, hydrogen is supplied as fuel gas and oxygen or air is respectively supplied to gas-passageway 16a of another side as oxidization gas at one gas-passageway 15a.

[0004] By the way, in order to make it not mix fuel gas and oxidization gas for each other, it is necessary to prepare the gas-seal section in the place where both gas meets. the part which needs this gas-seal section is the portion and the gas-diffusion-electrode side which the manifold of the interior of fluting separator, fuel gas, the entrance of each oxidization gas, and an outlet adjoins

[0005] Among this gas-seal section, about the interior of fluting separator, it is using the quality of the material which has gas impermeability, such as a metal and substantia-compacta carbon, in fluting separator, and a gas seal is possible and this seal method is adopted conventionally. Moreover, about the manifold contiguity section, the gas seal is performed by the method from the former of ****(ing) each manifold with an airtight container.

[0006] On the other hand, about the gas-diffusion-electrode side, as shown, for example in

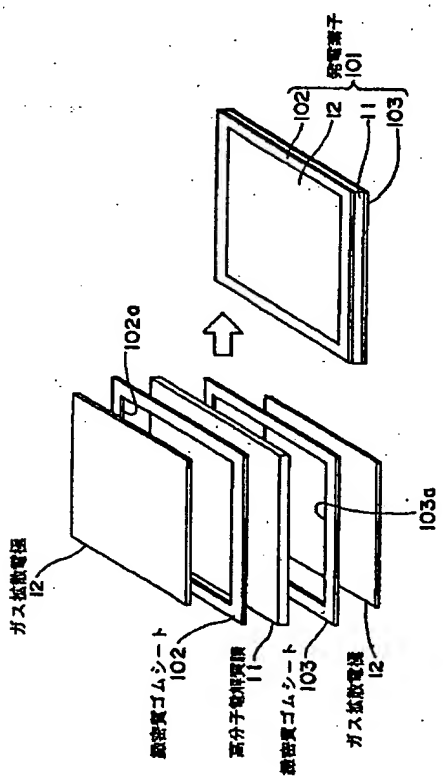
drawing 6 , using the caulking agent 17, this caulking agent 17 is thinly applied to a gas diffusion electrode 12 and 13 peripheries, these gas diffusion electrodes 12 and 13 are crushed by sticking by pressure, and the gas seal is performed.
[0007]
[Problem(s) to be Solved by the Invention] about the gas seal of the gas diffusion electrode 12 in the fuel cell of the conventional technology, and the 13 side, there is a problem that thickness selection of the caulking agent 17 used for this gas seal is difficult, carrying out a deer
[0008] That is, as shown in drawing 7 , when the thickness of a caulking agent 17 is too thick, there is a problem that the function which takes out current from the part 19 which contact to gas diffusion electrodes 12 and 13 and the fluting separator 15 and 16 is lost even if stuck by pressure, a crevice 18 is generated, consequently requires electric junction will be spoiled.
[0009] Moreover, when the thickness of a caulking agent 17 is too thin conversely, as shown in drawing 8 , a gas diffusion electrode 12 and the 13 side are not fully crushed, but there is a problem that a gas seal cannot be carried out.
[0010] Furthermore, when a pressure differential is in seal section both sides, the gas-seal method concerning the conventional technology cannot carry out a gas seal effectively, but gas leakage 20 occurs and it has the problem of receiving restrictions of a service condition (in addition, the allowable-pressure difference in the present condition seal method is about 0.1-0.2 MPas.).
[0011] On the other hand, in order to perform the gas seal of a gas-diffusion-electrode periphery certainly, and since the flexibility of selection of a service condition, especially an operating pressure is increased, the simpler and positive gas-seal method is desired.
[0012] this invention aims at gas-seal nature of a gas-diffusion-electrode periphery being made certainly, and offering a solid-state polyelectrolyte fuel cell with the high flexibility of service-condition selection in view of the situation described above.
[0013]
[Means for Solving the Problem] The composition of the solid-state polyelectrolyte fuel cell concerning this invention which attains the above-mentioned purpose In the solid-state polyelectrolyte fuel cell which comes mutually to carry out the laminating of the fluting separator which supplies fuel gas to the power generation element which consists of a polyelectrolyte film ****(ed) between gas diffusion electrodes, and one side of the above-mentioned gas diffusion electrode, and supplies oxidization gas to another side respectively The above-mentioned power generation element is characterized by providing a polyelectrolyte film, the substantia-compacta rubber sheet prepared in the periphery section of the film surface of this polyelectrolyte film, and the gas diffusion electrode prepared in the center section of the above-mentioned film surface.
[0014]
[Function] Since a gas diffusion electrode is prepared and stuck to the center section of the film surface by pressure and it comes to form a power generation element while preparing a substantia-compacta rubber sheet in the periphery of an electrolyte film, the power generation stack of a solid-state polyelectrolyte fuel cell can be formed by piling up a power generation element and fluting separator, without applying a caulking agent like before. Moreover, the electric contact to a gas diffusion electrode and fluting separator and the gas seal of the gas-diffusion-electrode side will be filled simultaneously.
[0015]
[Example] Hereafter, one example with the suitable solid-state polyelectrolyte fuel cell concerning this invention is explained in detail with reference to a drawing.
[0016] Drawing 1 is the schematic diagram of the power generation element of a solid-state polyelectrolyte fuel cell. Drawing 2 shows the schematic diagram of the manufacturing process. As shown in these drawings, it comes to consist of the solid-state polyelectrolyte fuel cell concerning this example gas diffusion electrodes 12 and 13 by which the power generation element 101 ****(ed) by fluting separator is inscribed in in notch 102a of the nature rubber sheet 102,103 of frame-like precise, and 103a in the polyelectrolyte film 11, the nature rubber sheet 102,103 of precise of the shape of a frame prepared in the periphery section of film surface 11a of this polyelectrolyte film, and the center section of this film

surface 11a.
[0017] As shown in drawing 2 (A) - (C), the portion which had applied the conventional caulking agent of gas diffusion electrodes 12 and 13 Namely, a notch, The frame-like substantia-compacta rubber sheet 102,103 is arranged by the same thickness. the portion concerned -- gas diffusion electrodes 12 and 13 and abbreviation -- with the polyelectrolyte film 11 While heat-and-pressure groundbreaking according gas diffusion electrodes 12 and 13 to hot pressing etc. prepares a gas diffusion electrode in the center section of film surface 11a of the polyelectrolyte film 11 in (the drawing 2 (B) reference) The substantia-compacta rubber sheet 102,103 is arranged in the periphery section, and it comes to form the sticking-by-pressure power generation element 101 (refer to drawing 2 (C)).
[0018] The thickness of these frame-like substantia-compacta rubber sheet 102,103 and gas diffusion electrodes 12 and 13 is almost the same, or its frame-like substantia-compacta rubber sheet arranged on the periphery section is [the slightly thicker one] more desirable from the point of adhesion. In addition, 104 illustrate the press board used at a hotpress process among drawing 2 (B).
[0019] Next, the outline of concrete manufacture of the power generation stack of a fuel cell is explained using drawing 3 and drawing 4 . As a polyelectrolyte film 11, thickness used the thing of the square whose size is 230mmx230mm by 0.1-0.2mm. As gas diffusion electrodes 12 and 13, thickness used the thing of the square whose size is 200mx200mm by 0.5-1.0mm. The substantia-compacta rubber sheet 102,103 was made into what has thickness thicker about 0.2-0.3mm than gas diffusion electrodes 12 and 13, and a size has the notches 102a and 103a in which the 200mx200mm gas diffusion electrodes 12 and 13 are inscribed by 230mmx230mm, and used the fluororubber a little with modulus of direct elasticity smaller than a gas diffusion electrode.
[0020] These were piled up and hot pressing was enforced under the conditions for 1 second - about 5 seconds the temperature pressing-down time of 350-380 degrees C. Consequently, thermocompression bonding of gas diffusion electrodes 12 and 13 and the substantia-compacta rubber sheet 102,103 was respectively carried out to the polyelectrolyte film, and they formed the power generation element 101 of the solid-state polyelectrolyte fuel cell of 2 (200mmx200mm) an electrode area of 400cm which has the rubber sheet section for gas seals with a width of face of 15mm in the periphery section.
[0021] Then, as shown in drawing 3 and drawing 4 , you carried out the laminating of the fluting separator 15 and 16 and the power generation element 101 of each other which has the rubber sheet section for gas seals obtained the account of a top, you made it stuck by pressure by the constant pressure, and the power generation stack 105 was formed. In addition, although the rubber sheet 102,103 is thick about 0.1-0.3mm compared with gas diffusion electrodes 12 and 13, in case the power generation element 101 and the fluting separator 15 and 16 are piled up and the power generation stack 105 is constituted from a state of a power generation element simple substance, in order to pile up in a constant pressure, a rubber sheet 102,103 and gas diffusion electrodes 12 and 13 become the same thickness, and a rubber sheet sticks with the gas diffusion electrode which carries out a compression set and adjoins, and comes to have the function of a gas seal.
[0022] Prepare the gas-seal section which arranged the substantia-compacta rubber sheet in the periphery of the film surface of a polyelectrolyte film, allot a diffusion electrode to the interior, and by thus, the thing to do for thermocompression bonding The process which the formation of a power generation element which has the rubber sheet section for gas seals becomes easy, piles up the power generation element 101 and the fluting separator 15 and 16 which were obtained, and forms the power generation stack 105 becomes simple compared with the former (conventionally). Managing thickness strictly, the caulking agent was applied and an element and separator were piled up.
[0023] Therefore, it became possible to perform a good gas seal, with the electric junction to a power generation element and fluting separator, i.e., the function which takes out current to the exterior, maintained. Moreover, in the portion which carries out the seal of hydrogen and the open air, when a hydrogen side was pressurized and it considered as a setup of foreign mind differential pressure 0.3039MPa, hydrogen was not detected at an open air side, but it was checked that gas-seal nature is improving conventionally.

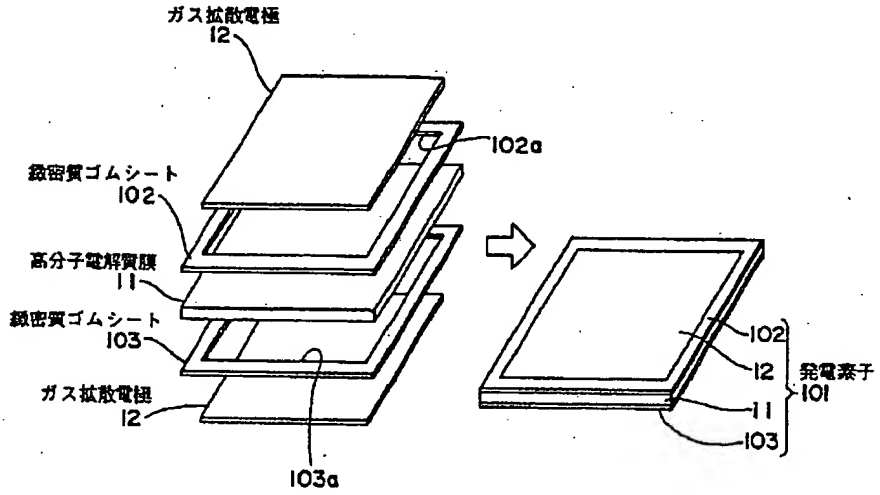
[0024]
[Effect of the Invention] The process which piles up the piezoelectric device and fluting separator which were obtained and constitutes a power generation stack becomes simple [the solid-state polyelectrolyte fuel cell concerning this invention], since a power generation element arranges and comes to stick the substantia-compacta rubber sheet for gas seals to the periphery section of the film surface of a polyelectrolyte film by pressure, as stated with the example above, and a good gas seal can be performed, with both electric junction maintained.

[Translation done.]

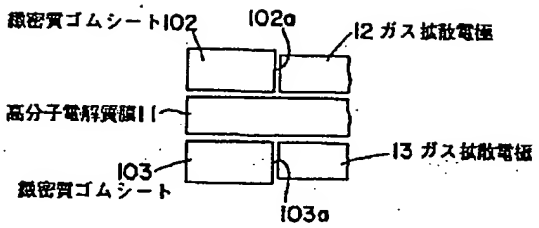
Repr. drawing:



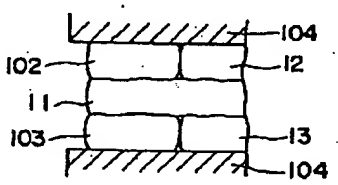
Drawing 1:



(A) ホットプレス前

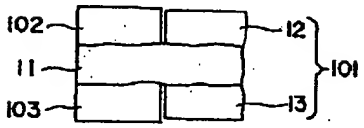


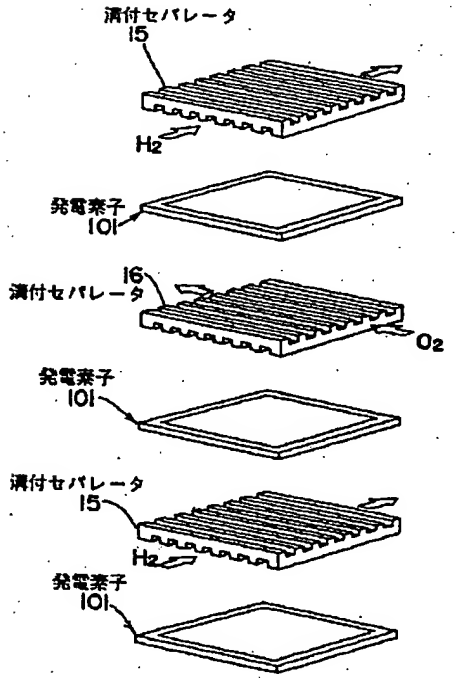
(B) ホットプレス中



(C) ホットプレス後

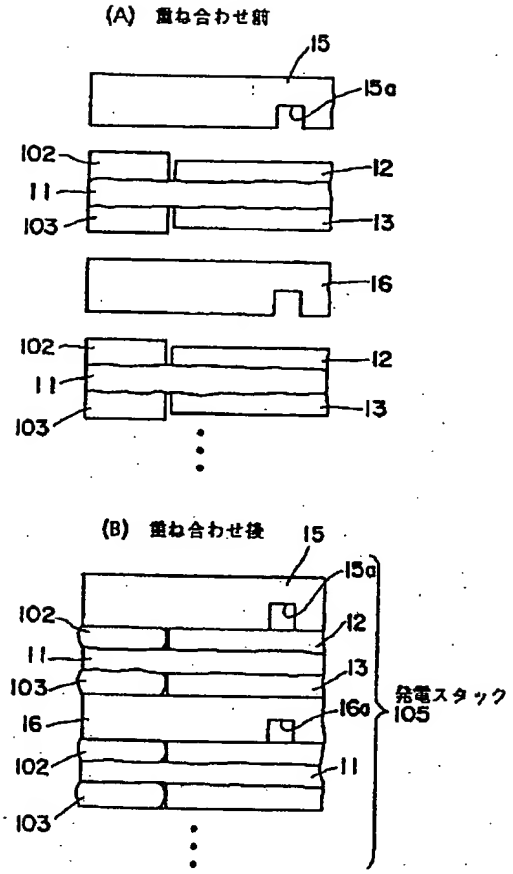
Drawing 2:



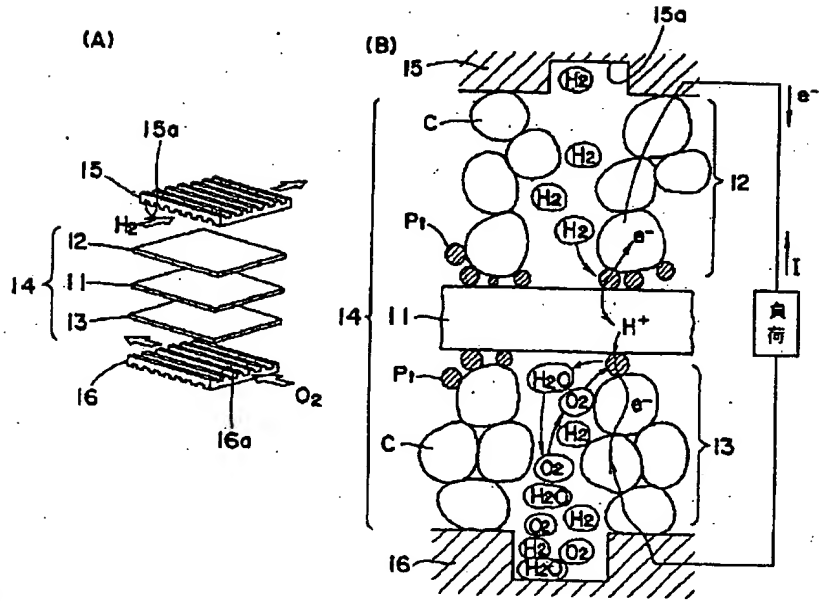


Drawing 3:

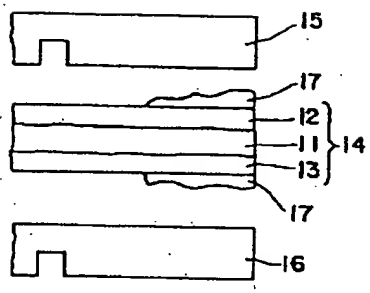
Drawing 4:



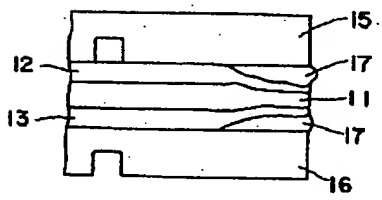
Drawing 5:



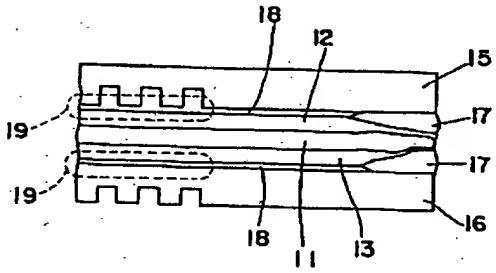
(A) 重ね合わせ前



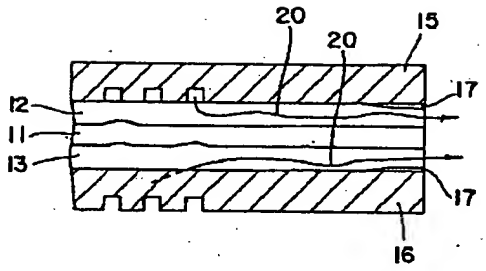
(B) 重ね合わせ後



Drawing 6:



Drawing 7:



Drawing 8: